of colour. The reproach laid against the true colour-theory of Newton that it was less fruitful for artistic ends than the false theory of Goethe, is impossible in the face of such modern works as those of Chevreul, Field, Helmholtz, Brücke, and von Bezold. And now Prof. Rood's new work will be welcomed as an addition to the literature of the subject.

The first two chapters are devoted to the general laws of light, and of its dispersion by refraction and by diffraction. Then comes a chapter on the three "constants" of colour, *purity*, *luminosity*, and *hue*, the term luminosity being employed, not as artists sometimes employ it to describe a particular "effect" of light and shade in a picture, but as the equivalent of the measurable intensity or brightness of the light. The author avoids the term "intensity" in this sense, that it may not be confounded with the term "saturation," a quality of colour which depends upon both purity and luminosity, and which is also sometimes erroneously spoken of as the "intensity" of a colour. The four following sections deal with the production of colour by interference and polarisation, by turbid media, by fluorescence and phosphorescence, and by absorption. The last of these chapters is very carefully written, and contains spectroscopic diagrams of a number of absorbing media. Their bearing upon the all-important question of the tint transmitted by two coloured media jointly is clearly explained. The remaining chapters are devoted to Young's Theory, Mixture of Colours, Complementary Colours, Colour Systems, &c. A concluding chapter deals with Painting and Decoration.

Following von Bezold, Prof. Rood rejects the term "indigo" introduced by Newton into the classification of the spectrum colours, and describes the colours between green and violet as *blue-green*, *cyan-blue*, *blue*, and *violet-blue*. The spectrum line F stands between "cyan-blue" and "blue," while "violet-blue" begins about half-way between F and G, and ends a little beyond the latter line. This classification differs slightly from that of Listing.

A detailed account is given of Maxwell's Theory of Colours, of the experiments by which he arrived at his results, and of the colour-chart devised by him. It is unfortunate, however, that the author has divided his excellent remarks on this head, giving part in an appendix to Chapter VIII., part in another appendix to Chapter XIV., and the elementary explanation of the method of balancing the colours upon p. 219 of the text. Apart from this awkward arrangement the matter is admirably put; and is the best exposition of Maxwell's theory in the language. Indeed it is singular that most English text-books ignore Maxwell's work in this department. In the English edition of Deschanel's "Natural Philosophy," which is almost the only one which touches the matter at all, the brief paragraph in which the theory is dealt with lacks the perspicacity that mostly distinguishes that well-known work.

There are one or two sentences in the work which cannot command our assent; and should be revised when another edition is called for. Thus, on p. 86, we are told that Becquerel and other earlier experimenters succeeded in obtaining fleeting photographs of the colours of the spectrum, but that "the colours thus obtained are produced merely by the *interference* of light." And again, "In blue eyes there is no real blue colouring matter *at all*" (p. 58). On p. 94 the author claims as his own an experiment described originally in this country by T. Rose, the inventor of the kalotrope. A reference is given on p. 82 to the darkening of tint of water when heated, due to increased absorption: but the author makes no reference whatever to the important observations of Gladstone, Hartley, and Ackroyd on the similar changes which take place in almost all coloured bodies when heated; nor to the significant observation of the last-named experimenter, that with increasing temperature the absorption appears to increase most in the blue end of the spectrum in the case of those solid bodies of fixed composition which expand with a rise of temperature, while it increases most at the red end for those few bodies such as iodide of silver which contract with a rise of temperature. Hering's theory of colours deserves a more extended notice than the very short note given in the final appendix. A brief account is given on p. 83 of a simple means devised by Simmler for observing the red rays which are abundantly reflected by green leaves: a thick plate of blue cobalt glass in conjunction with a plate of yellow glass serving to cut off all rays except the red and the blue-green. The writer of this notice independently described some few years ago a similar device, in which by taking a solution of permanganate of potash in a glass tank of a convenient size, the blue, green, and yellow rays were similarly absorbed, allowing only red and violet bands to pass, thus constituting, like Simmler's double plate, an erythroscope.

The portions of Prof. Rood's book which bear upon artists' work are numerous, and his observations are of importance. There is, for example, a careful discussion of the change of visible tint suffered by coloured surfaces under diminished illumination; and a parallel discussion of the results obtained by mixing pigments with a proportion of black. A list is given of those pigments which are liable to change or fade by exposure. The reason why oil colours do not materially change their tint on drying is carefully argued; and the *rationale* of Pettenkofer's "regeneration" process for picture-restoring is given. Chapter IX. sums up the indisputable evidence for regarding red, blue (or violet), and *green*, and not red, blue, and *yellow*, as the three fundamental colours, and later on is discussed the reason why a greater luminosity is obtained in mixing two colours optically, or by laying them side by side in minute touches, than is obtained by laying them over one another or by mixing them on the palette; and the author adds no less truly than concisely: "every mixture of pigments on the painter's palette is *a stride toward blackness*."

We can commend the volume to the notice of all who study colour, whether from an æsthetic or a scientific point of view. SILVANUS P. THOMPSON

OUR BOOK SHELF

Zeitschrift für das chemische Grossgewerbe. Kurzer Bericht über die Fortschritte der chemischen Grossindustrie. In Vierteljahres-heften, iii. Jahrgang. Unter Mitwirkung angesehener Technologen und Techniker. Herausgegeben von Jul. Post. (Berlin: Verlag von Robert Oppenheim, 1879.)

THIS volume is the third issue of an Annual Report of Chemical Technology in Europe and America, published

in quarterly parts, the contents of each part being arranged under the following heads :—

1. Generalities and Statistics, Description of Apparatus and Machinery, Heat-production.
2. Dry Distillation of Heating and Lighting Materials, Sulphide of Carbon, Petroleum, Coal-gas, Wood-tar, Asphalte, &c.
3. Sulphur, Acids, Alkalis, Aluminium Salts, Borates, Chromates.
4. Oils and Fats, Resins, Glycerin, Volatile Oils, Lubricating Materials.
5. Sugar, Starch, Fermentation, Wine, Beer, Spirits, Vinegar.
6. Food, Meat and its Preparations, Milk and Dairy Produce, Flour and Baking.
7. Dye-stuffs, Dyeing and Calico-printing.
8. Tanning.
9. Matches and Explosives.
10. Glass, Earthenware, Cement, Plaster.
11. Metallurgy—Iron, Copper, Tin, Lead, Bismuth, Antimony, Nickel, Mercury, Silver, Gold, &c.
12. Smaller Industries—Oxalic Acid, Cellulose, Salicylic Acid, Tartaric Acid, Chloral Hydrate, Mineral Waters, Chloride of Zinc.

Detailed criticism of the immense amount of matter contained in the 900 pages of the volume is, of course, impossible. Suffice it to say that the whole has been compiled with great care; every available source of information appears to have been thoroughly ransacked; and the necessarily condensed descriptions of the several processes and products are supplemented by copious references to original papers. Lists of chemical patents taken out in Great Britain, America, France, Belgium, and Austro-Hungary, are also given at the end of each quarterly part, the whole extending to forty closely-printed pages.

In the possession of such a report of chemical industry as the one now under consideration, and of the admirable *Jahresbericht* of Dr. Wagner, the manufacturers of Germany are certainly fortunate; and when we consider the vast extent and importance of chemical manufactures in England and America, it is matter of surprise and regret that no similar work exists in the English language. Projects for such a work have, indeed, been started in this country, but their execution appears to be a problem for the future.

Southern Stellar Objects for Small Telescopes, between the Equator and 55° South Declination, with Observations made in the Punjab. By J. E. Gore, M.R.I.A., A.I.C.E., &c. (Lodiana, 1877.)

THIS small work is divided into two sections. The first contains objects arranged according to the constellations, and chiefly selected from Sir John Herschel's Cape volume, which are within the scope of telescopes of very ordinary capacity, including double stars, clusters and nebulæ, with special reference to stars which may prove to be variable. The second section contains the more original work of the author, who was provided with telescopes 3 and 3·9 inches aperture, in the Punjab, and wholly relates to southern stars possibly variable, some new and noteworthy cases being adduced.

Mr. Gore appears to have made a useful comparison of Harding's "Atlas" with the sky, so far as relates to stars found in it, which do not occur in the great catalogue from the "Histoire Céleste" of Lalande, or are underlined in the "Atlas," and it is in such cases that he has met with the most decided evidence of variability. Amongst them we may note L. 1028, a star twenty minutes due north of L. 8951, one in R.A. about 4h. 58m. for 1880, N.P.D. 111° 14′, apparently variable from 6m. to 9m.; L. 19,662 from 4·5m. to 7m.; L. 23,228; Oeltzen 17,670 (No. 31 in Mr. Gore's list), observed three times by Argelander, and estimated 5, 7, and 5·6, which is 6m. in Harding, but not in Lalande or Heis; No. 37, or Oeltzen 20363, called "a fine ruby star" by Sir John Herschel, and 6½, and found to be only 8½ or 9m., and fiery red with a 3-inch refractor in July, 1875, and L. 43,239. Generally, the objects mentioned in the author's second section will deserve further examination.

There is frequent reference to the magnitudes assigned in Proctor's "Atlas," by the side of those given by such original authorities as Lacaille, Heis, or even Harding; this is a mistake, and is more calculated to mislead than to assist a judgment on the question of variability. The author of this Atlas distinctly states in his preface that he has followed the magnitudes of the British Association Catalogue except for stars in Sir John Herschel's list, which is a comparatively small one; the work is more of a popular description, and so far as we know may be useful to amateurs, but it is idle to quote the indications of this Atlas with those of Argelander or Heis, whose magnitudes are the results of actual comparison with the heavens. Probably after his clear reference to the source whence his magnitudes have been derived, no one will have been more surprised to find his work quoted as an authority in a question of change of brightness of a star than Mr. Proctor himself. We should hardly have referred to this point, were it not that others have made the same mistake as Mr. Gore.

There are many misprints in this small volume, which should be avoided in another edition.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

A New Nebula

ON November 14, the Rev. T. W. Webb discovered a small nebula, or nebulous star, in Cygnus. It is apparently identical with D.M. + 41, No. 4004, 8·5m.

1880 = 21h. 2m. 31s. + 41° 45′·3.

At Dunecht Observatory the object was seen, on November 22 and 23, to be approximately monochromatic, seen through passing clouds; about 5″ diameter. LINDSAY

Dunecht Observatory, November 24

Does Sargassum Vegetate in the Open Sea?

THE reply of Dr. Wild in NATURE, vol. xx. p. 578 to my query, does not satisfy me, for he partly cites old reports, that are, as I showed, mostly suspicious of being a mixture of the prevalent opinion since Columbus and observed facts.

If it has been stated formerly that pelagic varieties (?) multiply only by simple growth and subdivision, and a wide area covered with sea-weeds corresponding to the Sargasso Sea occurring in the North Pacific, I believe that is only a compilation. I crossed the Pacific Sargasso Sea (as it is printed on the charts) in December, 1874, from 140° W. long., 35° N. lat., to 174° W. long., 29° N. lat., and observed no Sargassum at all! But it is possible that the quantity differs in different years. I ask, therefore—and beg for personal observations only—has any one seen a difference in the quantity or density of floating Sargassum in different years, and in what degree or quantity has (1) brownish or olive-coloured, and (2) yellowish pale Sargassum been seen in several years?

A flowering branch with buds of any garden plant, if cut and put into water, does not wither suddenly, but sometimes opens continuous to the buds, and may even sprout, but never for a long time; but we never call such cut flowering branches put into a water-glass water plants. I take Sargassum to be analogical, and it should not be allowed to consider the dying broken Sargassum or Fucus, that swing in the open sea, as pelagic in habit, or as a living variety of the open sea.